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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10 041,791	10 19 2001	Tomoyuki Hirano	09792909-5225	3118

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EXAMINER

BOOTH, RICHARD A

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 02 07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/041,791

Applicant(s)

HIRANO ET AL.

Examiner

Richard A. Booth

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Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al., JP 08-306646A in view of Ghandhi, "VLSI Fabrication Principles".

Watanabe et al. shows the invention substantially as claimed including forming a semiconductor film on a substrate to be used as a capacitor electrode and then growing spherical or hemispherical grains on the surface of a semiconductor layer and diffusing an impurity, for instance phosphorous, to the grains grown on the surface of the semiconductor film (see abstract of Watanabe et al. and paragraph bridging pages 1 and 2 of applicant's specification).

Watanabe et al. fails to expressly disclose removing the impurity product, which is generated in the step of diffusing the impurity, from the surface of the semiconductor film using hot deionized water at a temperature of 30-80 celsius or using either a mixed solution of hydrochloric acid and hydrogen peroxide or a mixed solution of sulfuric acid and hydrogen peroxide, and removing a native oxide using a mixed solution of hydrofluoric acid and DI water.

Ghandhi discloses performing cleaning after each processing step (see page 641), for example, using a RCA solution which contains hydrochloric acid and hydrogen

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peroxide, for instance (see page 641, second full paragraph). With respect to the removal of the native oxide, the examiner takes official notice that inherently native oxide forms on an exposed silicon surface and this oxide needs to be removed because of its poor device characteristics. Accordingly, Ghandhi on page 649 discloses etching silicon oxide using a hydrofluoric acid/water mixture. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove the impurity product of Watanabe et al. using the cleaning process of Ghandhi because cleaning should be done after each processing step and cleaning using the methods listed above is commonly done in the art. Furthermore, it would have been obvious to use deionized water because this type of water does not affect the characteristics of the device. With respect to the temperature of the water, the temperature of the water used during cleaning would be optimized during routine experimentation and would not lend patentability to the instant application absent the showing of unexpected results.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al., JP 08-306646A in view of Ghandhi, "VLSI Fabrication Principles" as applied to claims 1-5 and 7-9 above, and further in view of Doan et al., U.S. Patent 5,767,005.

Watanabe et al. in view of Ghandhi are applied as above but fail to disclose using the HSG semiconductor film for a floating gate electrode.

Doan et al. discloses a floating gate composed of HSG (see col.). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Watanabe et al. so as to use the HSG film as a floating gate electrode because this will allow for a floating gate with higher memory capacity.

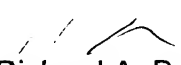
Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows the state of the art in HSG formation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is 308-3446. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 308-3325. The fax phone numbers for the organization where this application or proceeding is assigned are 308-7724 for regular communications and 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-1782.


Richard A. Booth
Primary Examiner
Art Unit 2812

January 31, 2003